

Utilization of a Next Generation Decellularized Dermal Allograft to Augment the Reconstruction of A2/A4 Pulleys of Left Ring Finger

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Surgical Summary

Clinical Presentation:

- A 42-year-old male was referred to the clinic for inability to straighten his left ring finger. Injury 2 years prior in which he jammed his finger. Following the injury, treatment consisted of physical therapy for two months and extensive splinting with no improvement.
- Focused examination:
 - Pain and inability to extend left ring finger, and inability to grip or grasp
 - 90-degree contracture of proximal interphalangeal (PIP) joint
 - Stiff to active range of motion (AROM) and passive range of motion (PROM)
 - Neurovascularly intact (NVI)
 - Flexor digitorum profundus (FDP) with good pull-through
- Standard radiographs: Normal impression.
- MRI: Demonstrated pseudo-boutonniere deformity of the left ring finger, with chronic rupture of A2, A3, A4, C1, C2 pulleys and fibrotic scarring in the soft tissues interposed between the fourth proximal phalanx, the PIP joint and the flexor tendons.
- As a result of the MRI findings and the pseudo-boutonniere, surgical options were discussed. The patient elected to proceed with reconstruction of the A2/A4 pulleys of his left ring finger.

Intraoperative Findings:

- A 90-degree contracture of the proximal interphalangeal (PIP) joint was identified with complete rupture of the A2 and A4 pulleys, with significant bowstringing of the flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) tendons (Figure 1).



Figure 1. Contracture with rupture identified.

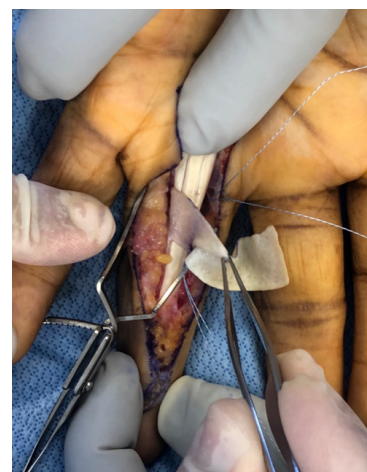


Figure 2. DermaPure[®] implantation.

Surgeon Perspective:

"One of the most feared surgical procedures is the reconstruction of the flexor sheath due to the known complications. This is the exact position I was in along with a reconstructed volar plate. I elected to utilize DermaPure to provide supplemental support. The procedure went well and the patient had reduced scarring."

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Surgical Procedure:

- A Bruner style incision was made on the volar aspect of the left ring finger. Full thickness skin flaps were elevated. Hemostasis was achieved with bipolar electrocautery.
- An extensive release of the checkrein ligament along with the volar plate was performed, allowing the tendons to achieve full extension along with the PIP joint.
- Due to the incompetency of the PIP joint of the volar plate, it was reconstructed using a slip of the FDS. This was procured and two 1.0 mm 3-0 Juggerknot[®] suture anchors were secured at the metaphysis of the condylar head of the proximal phalanx. The slip of FDS was then sutured into position and secured underneath the volar plate tissue.
- A 4 cm x 6 cm DermaPure[®] decellularized dermal allograft was then cut to size and two additional Juggerknot[®] suture anchors were placed at the anatomic proximal edge of the A2 pulley on the ulnar and radial aspect of the proximal phalanx (Figure 2). DermaPure[®] was then sutured into position, anchoring it at the four corners and along the ulnar and radial edges. Tension was maintained on the tendons to prevent further bowstringing. The same technique was performed for the A4 pulley (Figure 3).
- After irrigation, the skin was reapproximated using 5-0 nylon suture with a z-plasty performed at the level of the PIP joint.



Figure 3.



Figure 4.

Post-Operative Notes:

- Patient was maintained in a surgical dressing for one week. Sutures were removed at second post-op visit and patient was referred to hand therapy for a protective dorsal splint with a ring component over the A2 pulley.
- Aggressive PROM and AROM for six weeks.
- Seven weeks post-op, the patient developed motion loss and thickened scar tissue in the palm.
 - Returned to the OR for tenolysis of the FDP and FDS tendons. There were marked adhesions between the tendons and the periosteum. No adhesion to the DermaPure[®] graft which was integrating well into the tissues (Figure 4). No post-op immobilization. Early aggressive AROM.
- Five months post-op, full composite fist. Returned to full activity without restriction.

DermaPure[®] Implantation
4 cm x 6 cm
Basement Membrane
Outer-Most